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Moisture Content and Texture of DRIED CHILI PEPPERS Stored in Polyethylene-Lined Burlap Bags

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MOISTURE CONTENT AND TEXTURE OF DRIED CHILI PEPPERS STORED IN POLYETHYLENE-LINED BURLAP BAGS

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INTRODUCTION

The moisture content of chili peppers directly affects brittleness of the pods. Brittle pods shatter easily. This not only results in loss, but also increases the amount of dust which, during handling and storage, is very irritating to the skin and respiratory system. Pods that are too moist may decay, and may have to be dried a second time before they can be ground for use in chili powder.

The Agricultural Marketing Service conducted research under both laboratory and commercial conditions. Purposes of the research were (1) to determine the optimum moisture content of chili peppers and the atmospheric humidity that will produce this moisture content, (2) to evaluate the use of polyethylene bag liners in burlap bags to maintain a desired moisture content of the pods during storage in very moist or very dry rooms.

LABORATORY STUDIES

Moisture content of pods at various relative humidities

In the laboratory research at Beltsville, Md., duplicate chambers were kept at relative humidities of 40, 50, 60, 70, 80, and 90 percent. Figure 1 illustrates such a chamber. Sulfuric-acid solutions were used to obtain the desired relative humidities. The chambers were held at a constant temperature of 35° F. Dunmore hygrometer elements were mounted in the chambers and read periodically to determine the relative humidity. The pepper pods were cut into 1-inch segments, and randomized in the various relative humidity chambers. Pepper pods kept in each chamber were weighed at intervals until no further changes in weight occurred. At this time the moisture content of the pods was obtained by the toluene method, using the Dean-Starck trap.

The equilibrium moisture content of chili peppers at various relative humidities is shown in figure 2. Pods from chambers with atmospheres of 40 and 50 percent relative humidities contained only 6.4 and 9.2 percent of moisture. The pods were brittle after storage at both of these humidities, particularly those stored at 40 percent. The pods from the 60 and 70 percent relative humidities contained 11.4 and 13.4 percent of moisture. This range of humidity seemed best suited for peppers to be stored and used for chili manufacture as the pods remained pliable. Pods stored at 80 and 90 percent relative humidities had moisture contents of 21.9 and 28.4 percent and were too pliable for grinding.

Maintenance of Moisture Content in Polyethylene-lined bags

In the second laboratory test chili peppers were packed in polyethylene-lined burlap bags and in unlined burlap bags at two levels of initial moisture content--14.4 percent and 24.3 percent. Samples of each type of bag, some filled with peppers at one moisture

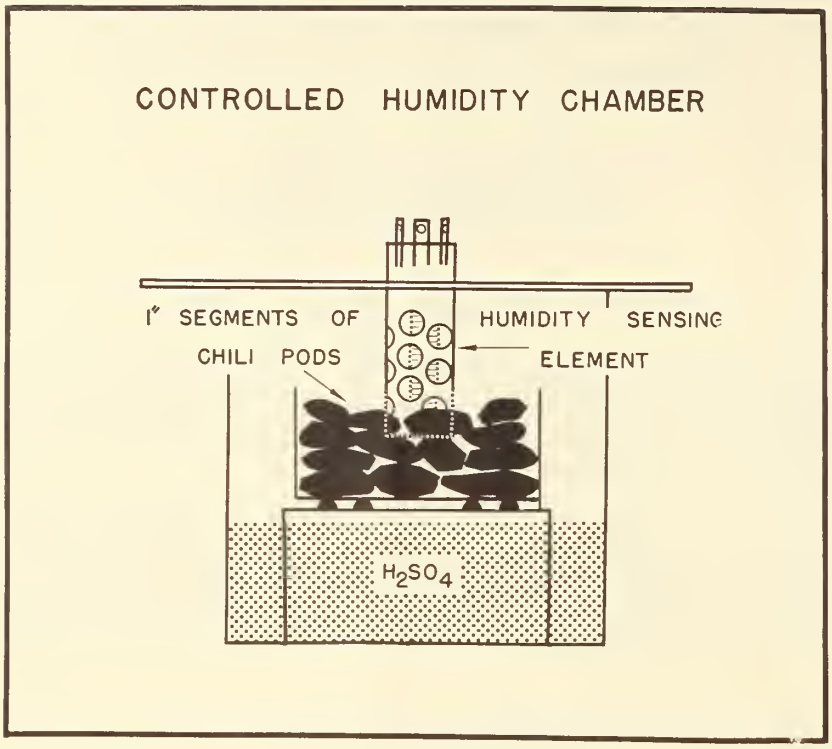

Figure 1. --Diagram of humidity chamber used in laboratory study of the equilibrium moisture content of dried chili peppers.

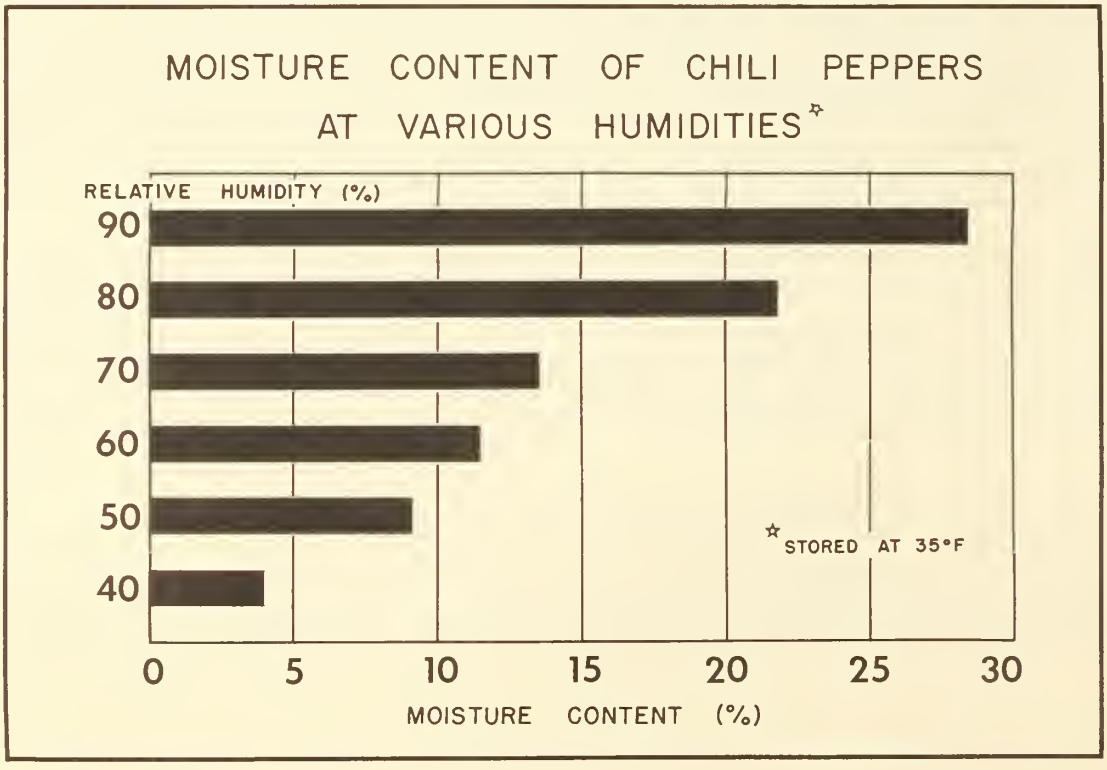

Figure 2

content and some at the other, were put in two large humidity chambers. These were held in a 40° F. storage room. One chamber was maintained at 90 percent relative humidity; the other at 40-50 percent.

The moisture content of the pods stored in polyethylene-lined burlap bags changed very little even after 84 days of storage under either high or low relative humidities. Under high humidity conditions, the moisture content of pods in unlined burlap bags increased significantly after 33 days of storage, while at low humidity conditions the moisture content of the pods decreased. No decay was found in the lined test packages while all of the pods in the unlined bags were decayed after 84 days of storage at high humidity (table 1).

TABLE 1.--Moisture content and decay of chili pepper pods stored at 40° F. under various conditions

Relative humidity of storage, initial moisture, and type of packaging	After 33 days' storage		After 84 days' storage	
	Moisture content	Decay	Moisture content	Decay
90 percent relative humidity				
High initial moisture content (24.3 percent):	Percent	Percent	Percent	Percent
Burlap only	31.2	50.4	38.4	100.0
Burlap with sealed poly-liner	24.2	0	24.8	0
Low initial moisture content (14.4 percent):				
Burlap only	29.2	49.5	36.4	100.0
Burlap with sealed poly-liner	14.4	0	14.8	0
40 to 50 percent relative humidity				
High initial moisture content (24.3 percent):				
Burlap only	11.8	0	10.4	0
Burlap with sealed poly-liner	22.6	0	21.0	0
Low initial moisture content (14.4 percent):				
Burlap only	9.6	0	10.4	0
Burlap with sealed poly-liner	14.4	0	13.8	0

STUDIES UNDER COMMERCIAL CONDITIONS

Results of Storage in lined and unlined bags

Polyethylene bag liners for the storage of dried chili peppers were tested under commercial conditions. Peppers were placed in test packages consisting of 6 closely woven burlap bags, 3 of which contained 2-mil polyethylene liners. The packages were packed in South Carolina, and shipped by rail to Baltimore where they were placed in storage.

Moisture determinations were taken when the peppers arrived at Baltimore, and at monthly intervals thereafter. On arrival the moisture content of the pods was 13.6 percent for the polyethylene-lined bags and 15.2 percent for the unlined burlap bags. It is assumed that the peppers in the unlined bags absorbed moisture from the atmosphere during transit; however, this could not be checked as moisture content was not taken at the shipping point.

During the 10 1/2-month storage period, the mean daily storage temperature was 43.4° F. and the mean relative humidity was 64.7 percent. Temperature and relative humidity of the storage room were fairly constant throughout the test period, with slight variations during short periods when new shipments of peppers were added, or when peppers were withdrawn for processing.

Pods stored in polyethylene-lined burlap bags gained only 0.4 percent, and those stored in burlap with no liner gained 3.2 percent, during the 10 1/2 months of storage (fig. 3). Those in the lined bags maintained a fairly constant moisture content throughout this period. Under these storage conditions, decay was not a problem.

Advantages of using lined bags in commercial storage

Bags reduce irritating dust during handling; they maintain constant moisture content from shipping point to grinding process; and they permit the successful storage of chili pods in rooms with a wider range of relative humidities.

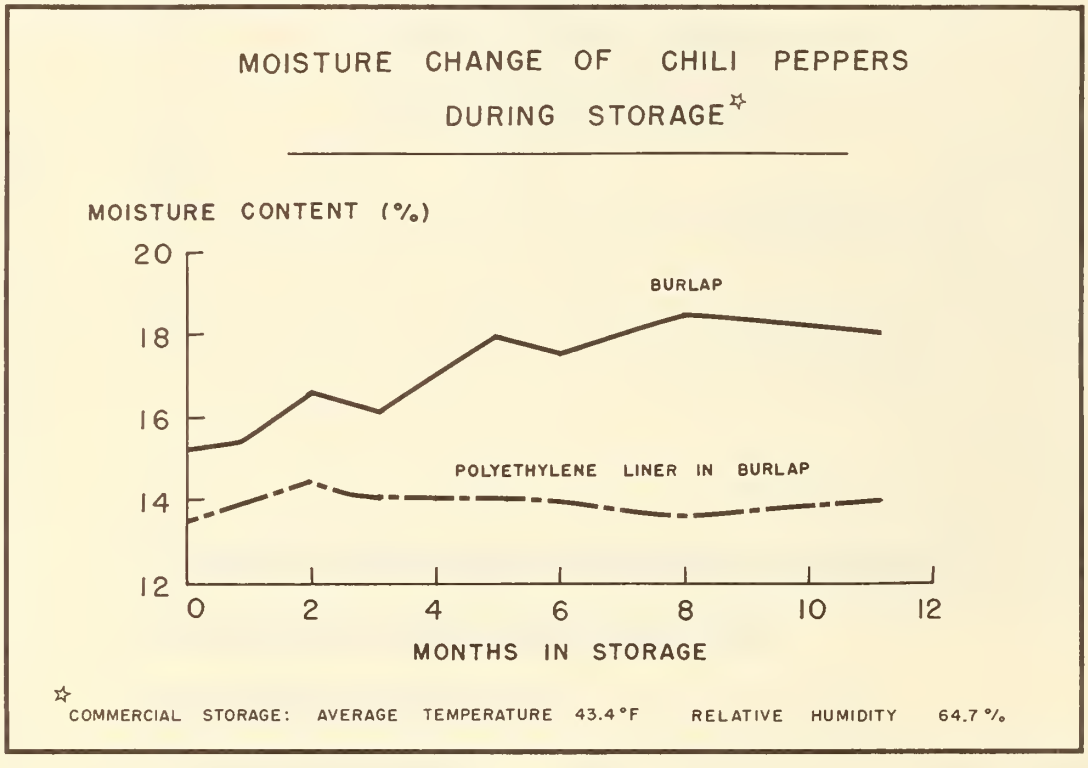

Figure 3